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This warranty does not cover and Proxim will not be liable for any damage or failure caused by misuse, abuse, acts of God, accidents, or other causes beyond Proxim's control, or claim by any entity other than the original purchaser.

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- ❑ As a result of any event, circumstance, action, or abuse beyond the control of Proxim, Incorporated

Whether such damages be direct, indirect, consequential, special or otherwise and whether such damages are incurred by the person to whom this warranty extends or a third party.

Harmony 802.11b Access Point Model 855x User's Guide
Part # 7360.0133
Rev. E

Warranty Return Policy

If you have a problem with the Harmony 802.11b Access Point Model 855x, please call Proxim Technical Support at 1-408-731-2640. Proxim Technical Support will assist with resolving any technical difficulties you may have with your Proxim product.

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This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- ☐ Reorient or relocate the receiving antenna.
- ☐ Increase the separation between the equipment and the receiver.
- ☐ Connect the equipment into an outlet on a circuit different from that which the receiver is connected.
- ☐ Consult the dealer or an experienced radio/TV technician for help.

Declaration of Conformity
Déclaration de Conformité
Konformitätserklärung

The Manufacturer: Le Constructeur: Der Hersteller:	**Proxim Europe B.V.**
Address: Addresse: Addresse:	**Strawinskylaan 3127** **1077 ZX, P.O. Box 7067,** **1007 JB Amsterdam, The Netherlands**

Declares that the Product:
Déclare que le Produit:
Erklärt, dass das Produkt:

Type:	**Harmony**
Model:	**8550 Access Point**
Variant Model:	**8551 Access Point**

meets the essential requirements according to article 3 of the following EC-Directive:
est conforme aux exigencies essentielles d'article 3 de la Directive CE:
die grundlegenden Anforderungen gemäâ Artikel 3 der nachstehenden EU-Richtlinie erfült:

> **Directive 1999/5/EC of the European Parliament and of the Council of 09 March 1999 relating to Radio and telecommunications Terminal Equipment (R&TTE), including the mutual recognition of their conformity.**
> Directive 1999/5/EC du Parlement Europeen et du Conseil du 09 mache 1999 concernant les radio et equipments terminaux de telecommunications, incluant la reconnaissance mutuelle de leur conformite.
> Richtlinie 1999/5/EG des Europäischen Parlaments und des Rates vom 09. März 1999 über Funkanlagen und Telekommunikationsendeinrichtungen und die gegenseitige Anerkennung ihrer Konformität.

and that the following harmonized standards have been applied:
et que les standards marmonises suivants ont ete appliqués:
und dass die folgenden harmonisierten Normen angewandt wurden:

ETS 300328 / July 1997
ETS 300826 / November 1997
EN 60950 / August 1992
IEC 950 / 1991 Second Edition

Equipment Class Identifier CE0560 (!)

This Product is a Class-2 under the scope of the R&TTE. Be aware that France uses other frequencies. This means that products bought elsewhere might cause problems in the above mentinoned country(ies) and should be avoided.

Amsterdam, 11 May 2001
Place and Date of the declaration
Lieu et date de la declaration – Ort und Datum der Konformitätserklärung

Name and Signature
Nom et Signature – Name und Unterschrift
Carmelo S. Amarena
International Product Manager
Proxim, Inc. & Proxim Europe B.V.

PROXIM EUROPE B.V.
INTERNATIONAL
DEPARTMENT
THE NETHERLANDS

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1. Introduction

Thank you for choosing Proxim's Harmony 802.11b Access Point Model 855x, a member of Proxim's Harmony wireless infrastructure family. The Harmony 802.11b Access Point complies with the IEEE 802.11b wireless standard to provide mobile clients with network connectivity at data rates of up to 11 Mbps.

The Harmony 802.11b Access Point can be used on its own or in conjunction with a Harmony Access Point Controller. A stand-alone Harmony 802.11b Access Point connects to a small Ethernet network to provide wireless access for mobile clients. When used in conjunction a Harmony Access Point Controller, the Harmony 802.11b Access Point is part of a single wireless networking solution that supports all current and future wireless LAN standards, including OpenAir, IEEE 802.11b, and future 10 Mbps frequency hopping and 5 GHz technologies, simultaneously within a single, homogeneous architecture. A Harmony system of Access Point Controllers and Access Points provides centralized management, configuration, and security for a wireless LAN.

Proxim is the leading supplier of wireless networking solutions. Proxim's unmatched expertise in spread spectrum radio networking technology, combined with the company's extensive experience serving the communication needs of the mobile computing user, have kept Proxim at the forefront of the wireless LAN market.

The Harmony Family

The Harmony 802.11b Access Point Model 855x is a member of a product family that provides a complete wireless networking solution.

- The **Harmony Access Point Controller Model 7560** centralizes the management, security, and filtering capabilities of a wireless LAN. The Access Point Controller communicates with Harmony Access Points over the Ethernet network to provide wireless network access for mobile clients. The Access Point Controller can support multiple Access Points, even if each Access Point follows a different wireless standard.

- The **Harmony Access Point** is a networking bridge that operates at Layer 2 of the OSI networking model. Working in conjunction with a Harmony Access Point Controller, the Access Point forwards packets between its radio and the Ethernet network. Two types of the Harmony Access Point are available to support either the OpenAir or IEEE 802.11b wireless standards: the **OpenAir Access Point Model 7550** and the **802.11b Access Point Model 855x**. Note that the 802.11b Access Point does not require an AP Controller to provide mobile clients with wireless network access.

- The **Harmony PC Card** is a wireless LAN adapter that fits into a PCMCIA Type II slot in a laptop computer. Two models of the Harmony PC Cards are available to support either the OpenAir or IEEE 802.11b wireless standard: the **7430 Series OpenAir PC Card** and the **8430 Series 802.11b PC Card**.

- The **Harmony 802.11b PCI Card** is a wireless LAN adapter that fits into a standard PCI expansion slot and complies with the IEEE 802.11b wireless standard.

- The optional **Harmony Power System Model 7562** provides remote DC power to Harmony Access Points over the unused pins of a twisted pair Ethernet cable.

Harmony 802.11b Access Point Model Numbers

There are two models of the Harmony 802.11b Access Point available. Both models offer the same functionality and have the same user interface.

Model 8550 is a Harmony 802.11b Access Point that ships with an integrated antenna that provides diversity. This antenna supports two positions: up and down. For best results, place the antenna in the up or vertical position, as shown in Figure 1 on page 13. The integrated antenna cannot be removed from the Model 8550 Access Point.

Model 8551 is a Harmony 802.11b Access Point that ships with two Reverse polarity TNC connectors (also known as R-TNC). This model supports external antenna options that can increase the range of the Harmony 802.11b Access Point. It includes two antenna connectors to support antenna diversity, which can improve system reliability. Due to the characteristics of radio waves, it is possible that one antenna may provide better performance than a second antenna installed a short distance away. Note that a second antenna provides diversity only; it cannot be used to further increase the range of the Access Point or increase its coverage area. When two antennas are connected to the Access Point, only one antenna is in use at any point in time.

The Model 8551 Access Point ships with two 1-dBi omnidirectional antennas (Model 7015) that connect directly to the unit’s R-TNC antenna connectors. High-gain external antennas and antenna cabling for the Model 8551 AP are sold separately. Contact your Harmony reseller for information on the available antennas that have been certified for use with this Access Point.

The IEEE 802.11b Specification

In 1997, the Institute of Electrical and Electronics Engineers (IEEE) adopted the 802.11 standard for wireless devices operating in the 2.4 GHz frequency band. This standard includes provisions for three radio technologies: direct sequence spread spectrum, frequency hopping spread spectrum, and infrared. Devices that comply with the 802.11 standard operate at a data rate of either 1 or 2 Mbps.

In 1999, the IEEE created the 802.11b standard. 802.11b is essentially identical to the 802.11 standard except 802.11b provides for data rates of up to 11 Mbps for direct sequence spread spectrum devices. Under 802.11b, direct sequence devices can operate at 11 Mbps, 5.5 Mbps, 2 Mbps, or 1 Mbps. This provides interoperability with existing 802.11 direct sequence devices that operate only at 2 Mbps.

Direct sequence spread spectrum devices spread a radio signal over a range of frequencies. The IEEE 802.11b specification allocates the 2.4 GHz frequency band into 14 overlapping operating Channels. Each Channel corresponds to a different set of frequencies. See Appendix B to determine the center frequency used by each Channel.

If operating multiple 802.11b Access Points in the same vicinity, the distance between the center frequencies must be at least 25 MHz to avoid interference. Note that the Channels available to an 802.11b Access Point will vary from country to country.

In the United States, the 802.11b standard allocates 11 operating Channels for direct sequence devices. Channels 1, 6, and 11 are independent and do not overlap with each other. To avoid interference between 802.11b Access Points, Proxim recommends that you configure the Access Points using only Channels 1, 6, and 11 (if available).

The 802.11b operating parameters are described in Chapter 5.

System Requirements

To begin using the Harmony 802.11b Access Point, you must have the following minimum requirements:

- ☐ An Ethernet (10Base-T) LAN switch or hub
- ☐ At least one 802.11b adapter

Note:
If you want to create a Harmony system that provides centralized management, configuration, filtering, and security, you will also need at least one Harmony Access Point Controller.

The Product Package

Each Harmony 802.11b Access Point comes with:

- ☐ One Harmony 802.11b Access Point Model 855x
- ☐ One power adapter (12V, 1 Amp)
- ☐ Two model 7015 1-dBi omnidirectional antennas (Model 8551 only)
- ☐ One *Harmony 802.11b Access Point Model 855x User's Guide*
- ☐ One warranty registration card

2. Installation

This chapter describes the installation procedure for the Harmony 802.11b Access Point and includes a description of the LEDs found on the unit.

Installation Procedure

Follow these steps to install the Harmony 802.11b Access Point Model 855x.

Note:

If you have a Harmony Access Point Controller, install it first before installing a Harmony Access Point.

1. Determine the best location for the Harmony 802.11b Access Point. Keep in mind the following considerations:

   ☐ The length of the Ethernet cable that connects the Access Point to the network must not exceed 100 meters.

   ☐ For Model 8550 Access Points, try to place the Access Point on a flat, sturdy surface as far from the ground as possible, such as on top of a desk or bookcase, keeping clear of metal obstructions and away from direct sunlight.

   ☐ For Model 8551 Access Points, install the external antennas so that they are clear of obstructions; refer to the documentation that came with the antennas for mounting and installation instructions.

   ☐ Try to centrally locate the Access Point or its antennas so that it will provide coverage to all of the mobile devices in the area.

   ☐ If you are not using the Harmony Power System to supply power to the Access Point, the distance between the Access Point and a power outlet cannot exceed the length of the power adapter’s cable.

Warning!

It is the responsibility of the installer and users of the Harmony 802.11b Access Point Model 855x to guarantee that the antenna is operated at least 20 centimeters from any person. This is necessary to insure that the product is operated in accordance with the RF Guidelines for Human Exposure which have been adopted by the Federal Communications Commission.

2. Place the Access Point in the desired location. An optional wall mount is available for the Access Point. Refer to the section entitled "Mounting Option" later in this chapter for details.

3. If you are using a Model 8551 Access Point, connect the two 7015 antennas directly to the unit. If you are using another model of external antenna, connect the antennas to the Access Point's antenna connectors with low-loss antenna cabling.

4. Attach one end of an Ethernet cable to the Access Point and attach the other end to the 10Base-T port of a network hub, switch, router, or patch panel.

Note:

The Harmony 802.11b Access Point does not support 100Base-TX; it only supports 10Base-T.

5. If you are not using the Harmony Power System to supply power to the Access Point or want to connect the Access Point to both the Power System and an AC power source, attach one end of the AC power adapter, included in the product package, to the back of the Access Point and the other end to a power outlet.

Note:

Use the Access Point only with the power adapter supplied by Proxim in the product package. Using another power supply may damage the Access Point. If you want to use the Access Point in conjunction with the Harmony Power System, refer to the Harmony Power System Model 7562 User's Guide *for instructions.*

All three LEDs on the top of the Access Point will light up momentarily when the unit is powered on. In addition, the green Link LED will turn on to indicate that the Access Point has a network connection.

By default, the Harmony 802.11b Access Point will attempt to find an AP Controller to partner with. During this process, the Access Point's Status LED will be amber.

5. If you have one or more AP Controllers on the network, an AP Controller will automatically detect and configure the Access Point over the network (this assumes that you have not disabled the Harmony system's ability to automatically detect new Access Points). The Access Point's Status LED will turn solid green. Refer to the *Harmony Access Point Controller Model 7560 User's Guide* for more information on how to configure an Access Point.

6. If you do not have an AP Controller on the network, the Access Point will automatically switch to Independent mode (which does not require an AP Controller) if it cannot find an AP Controller within one minute of booting up. The Access Point's Status LED will blink green in a repeating pattern (the LED will remain on for two seconds and then turn off momentarily). Refer to Chapter 4 for information on how to configure the Access Point.

Mounting Option

The Harmony 802.11b Access Point is designed to sit on a desktop. In addition, an optional mounting bracket is available for purchase so that the unit may be mounted to a wall or ceiling.

Follow these steps to attach the mounting bracket to the Access Point:

1. Remove the two rubber feet on the bottom of the AP. Note that the rubber feet are attached to the unit with an adhesive.

2. Underneath the rubber feet there are three unthreaded holes that accept M5 thread forming screws. Align the holes of the mounting bracket with these holes.

3. Locate the screws provided with the mounting bracket.

4. Insert the screws into the three holes of the mounting bracket and AP (that is, the holes aligned in Step #2 above).

5. Tighten the screws with a screwdriver to attach the mounting bracket to the AP.

LED Indicators

There are three LEDs on the top panel of the Harmony 802.11b Access Point, as shown in Figure 1 (which is a picture of a Model 8550 Access Point). In addition, there is one LED on the Access Point’s back panel.

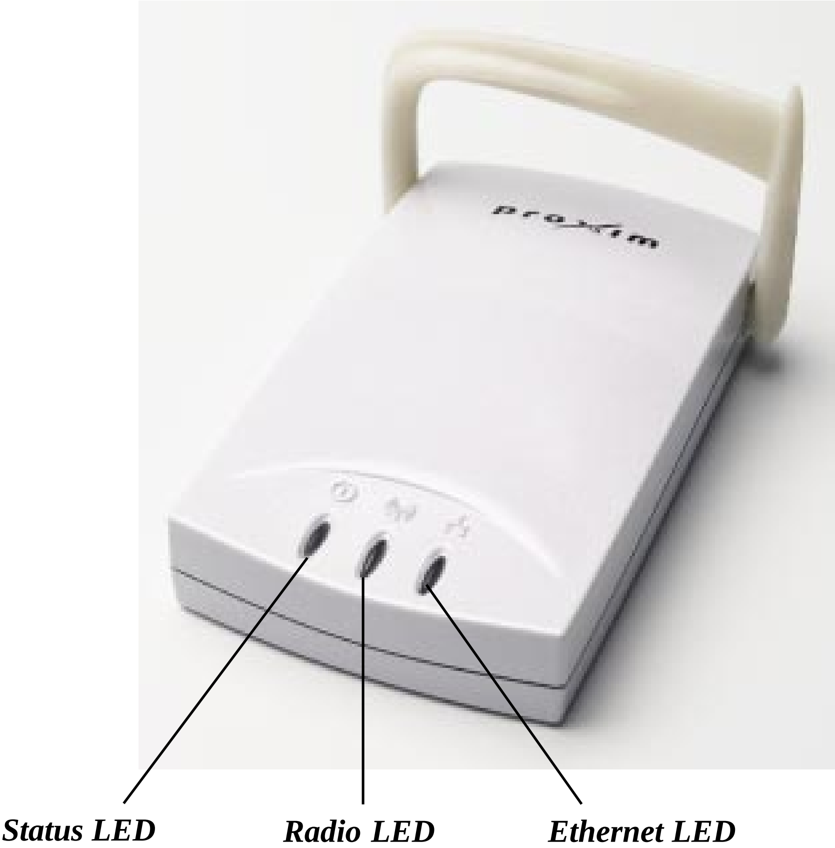


Figure 1
Harmony 802.11b Access Point’s Top Panel LEDs

Status LED

The Ethernet LED is located on the left side of the Access Point's top panel (with the unit orientated so that you can read the Proxim logo).

The following table describes the behavior of the Status LED.

LED Behavior	Status
Off	Unit is not powered on
Solid Amber	AP is either 1) initializing or 2) not partnered with an AP Controller
Blinking Amber	AP requires a new firmware image; see Chapter 9
Solid Green	AP is partnered with an AP Controller and is operational
Blinking Green (2 seconds on, then 1 blink)	AP is in Indepedent mode and is operational
Blinking Red	A problem has occurred; see Chapter 9 for an explanation of the blinking patterns

Radio LED

The Radio LED is the middle LED on the Access Point's top panel and blinks green when the Access Point receives data packets over its radio.

Ethernet LED

The Ethernet LED is located on the Access Point's top panel to the right of the Radio LED (with the unit orientated so that you can read the Proxim logo) and blinks green when the Access Point receives data packets over the 10Base-T Ethernet port.

Link LED

The Link LED is located on the Access Point’s back panel between the power connector and the 10Base-T port and turns green when the Access Point has a physical connection to the Ethernet network.

Power Requirements

The Harmony 802.11b Access Point requires power from either a Harmony Power System or from an external power supply.

The voltage range for the Access Point’s power connector is 10-26 VDC.

The Harmony 802.11b Access Point ships with a UL listed, Class 2 power supply (12V, 1 Amp).

3. Wireless Operation

This chapter describes how the Harmony 802.11b Access Point provides network access to mobile clients.

It begins with a discussion of the Access Point's operating modes and the parameter known as AP Controller Dependence. AP Controller Dependence determines whether the Access Point operates on its own or in conjunction with an AP Controller.

This chapter concludes with a description of how mobile clients roam between Access Points while maintaining seamless network connectivity.

AP Controller Dependence

The Harmony wireless infrastructure family is designed to grow with your network. For isolated Ethernet networks that contain less than 512 nodes and connect to a single router, the Harmony 802.11b Access Point can operate as a stand-alone bridge to provide network access to mobile clients.

But as you increase the number of Access Points or the complexity of the network, you can add an Access Point Controller to provide centralized management and configuration for the Access Points. Also, a Harmony system with an AP Controller offers several additional features that are not available with the stand-alone Harmony 802.11b Access Point, such as:

- ☐ Authorization Table for Added Security
- ☐ Roaming Across a Router
- ☐ Packet Filtering Based on Protocol Type
- ☐ SNMP Management
- ☐ Management of Access Points via a Single User Interface

Refer to the *Harmony Access Point Controller Model 7560 User's Guide* for more information on these features.

Note:

For best performance, Proxim recommends using a Harmony 802.11b Access Point without an AP Controller on isolated Ethernet networks that contain less than 512 nodes and connect to a single router. The Access Point has limited filtering and forwarding capabilities and may have difficulty keeping up with the amount of traffic on larger networks. This limitation does not apply to the Harmony AP Controller.

The Harmony 802.11b Access Point supports three modes of operation:

- **Independent:** The Access Point operates as a stand-alone device to provide network access to mobile clients.
- **Dependent:** The Access Point partners with an Access Point Controller to provide network access to mobile clients.
- **Flexible:** The Access Point operates in Dependent mode if an AP Controller is installed on the network; otherwise, it operates in Independent mode.

By default, the Access Point operates in Flexible mode.

Note:

If you configure a Harmony 802.11b Access Point to operate in Independent mode, you can always add an AP Controller to the network at a later date and reconfigure the Access Point to operate in Dependent or Flexible mode.

Independent Mode

When AP Controller Dependence is configured to Independent, the Harmony 802.11b Access Point will operate as a MAC layer learning bridge and forward packets between mobile clients and the Ethernet network.

A wireless LAN that uses the Harmony 802.11b Access Point in Independent mode generally consists of one or more 802.11b Access Points and one or more mobile clients that have an 802.11b adapter installed, as shown in Figure 2.

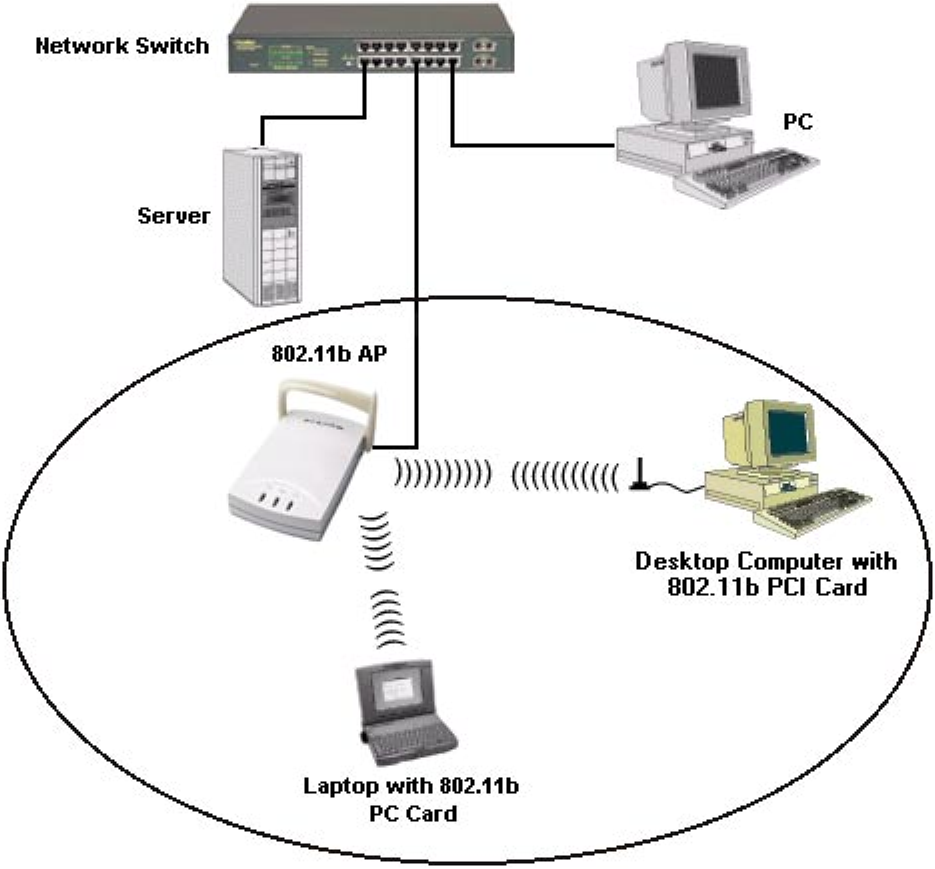


Figure 2
802.11b Access Point in Independent Mode

The Access Point maintains a table of MAC addresses, which it has learned are located either on the Ethernet network or on the radio network by monitoring the source address of packets it receives. For example, if the Access Point receives a packet over its radio, it creates an entry in its table for the node that sent the packet and labels the entry as a member of the radio network. The Access Point removes an entry from the table after five minutes of inactivity.

When the Access Point receives a packet from the Ethernet network, it compares the packet's destination address with the node addresses listed in its table. If the packet's destination address is not in the table, the Access Point will forward the packet to the mobile clients. If the packet's destination address is listed in the table as a member of the radio network, the Access Point will forward the packet to the mobile clients. If the packet's destination address is listed in the table as a member of the Ethernet network, the Access Point will not forward the packet to the mobile clients. The Access Point applies the same principles to determine if a packet received over its radio should be forwarded to the Ethernet network.

An Access Point in Independent mode cannot filter out Ethernet packets based on protocol type, and it will forward all broadcast packets to mobile clients. Given this, the Access Point can only support a limited amount of network traffic. Proxim recommends that you only use an Access Point in Independent mode on networks that contain less than 512 nodes.

The number of mobile clients that can be supported by the Harmony 802.11b Access Point depends on the amount of information that each client exchanges with the network. Therefore, the number of clients that can be supported by one Access Point will vary based on the applications in use and how frequently network information is accessed.

When operating in Independent mode, the Access Point's Status LED blinks in a repeating pattern: the LED is green for two seconds and then it blinks off momentarily.

Note:
An Access Point in Independent mode will not attempt to communicate with an AP Controller, even if one is present on the network.

Dependent Mode

When AP Controller Dependence is configured to Dependent, the Harmony 802.11b Access Point is a member of a Harmony system and works in conjunction with a Harmony Access Point Controller.

A Harmony system generally consists of one or more Harmony AP Controllers, one or more Harmony Access Points, and one or more mobile clients that have an 802.11b adapter installed, as shown in Figure 3.

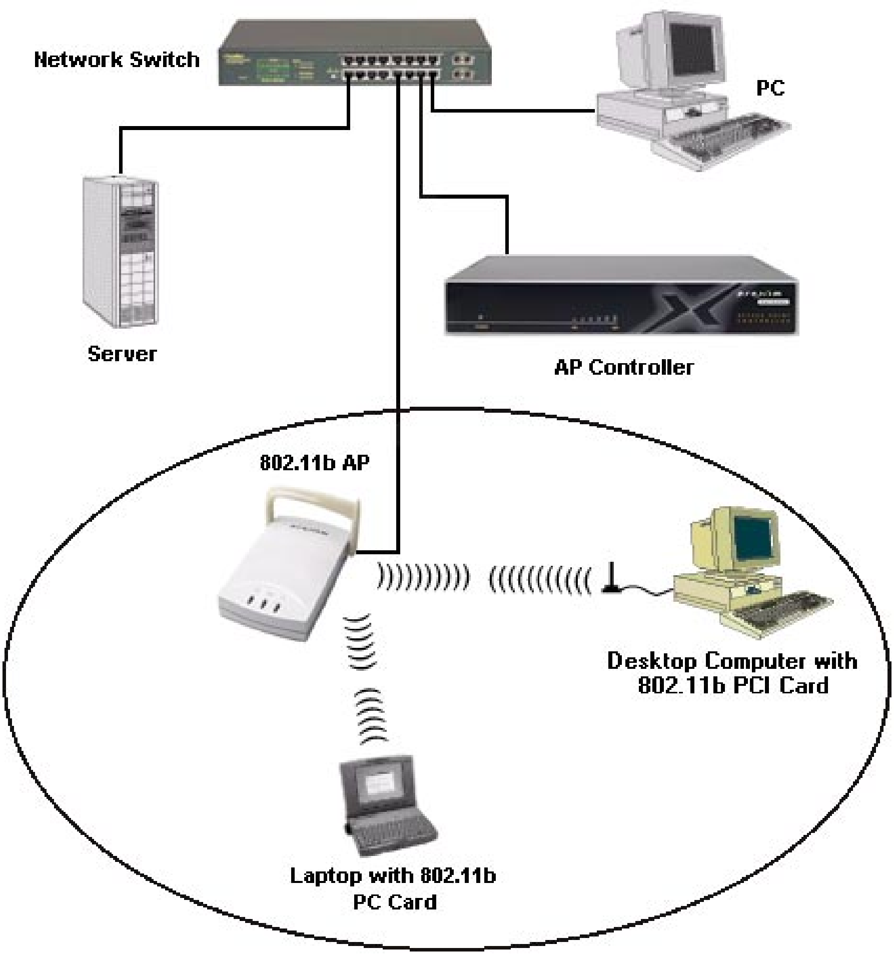

Network Switch
PC
Server
AP Controller
802.11b AP
Desktop Computer with 802.11b PCI Card
Laptop with 802.11b PC Card

Figure 3
802.11b Access Point in Dependent Mode

A Harmony AP Controller handles all of the configuration and management of the Access Points on the network. Each Access Point acts as an intermediary between its mobile clients and the AP Controller, converting radio signals into Ethernet packets and vice versa. The AP Controller monitors the Ethernet traffic and decides which packets should be forwarded to mobile clients.

Note:

The Harmony 802.11b Access Point should be used in conjunction with a Harmony Access Point Controller on Ethernet networks that have more than 512 nodes or require the advanced management, security, and filtering features provided by the Harmony system.

An Access Point in Dependent mode communicates exclusively with the AP Controller: the AP forwards all of the packets it receives over its radio to the AP Controller for processing. The AP and the AP Controller use a technique known as “IP Tunneling” to encapsulate packets destined for or sent by mobile clients. Encapsulated packets from the Access Point are destined for the AP Controller’s IP address; encapsulated packets from the AP Controller are destined for the Access Point’s IP address.

A single AP Controller can support a maximum of 10 Access Points (an AP Controller can support more than 10 Access Points but a maximum of 10 APs per AP Controller is the recommended configuration for best performance). A network subnet can support up to 10 AP Controllers to form a Harmony system that can be managed using a single user interface. The number of clients that can be supported by one Access Point depends on the amount of information that each client exchanges with the network. Therefore, the number of clients that can be supported by one Access Point will vary based on the applications in use and how frequently network information is accessed.

An Access Point and AP Controller do not need to be on the same switch or hub in order to communicate. In addition, Access Points may be installed on different IP subnets from the AP Controller(s) on the local subnet.

When a Harmony 802.11b Access Point is connected to the network for the first time, the AP Controller automatically configures it with the AP AutoConfigure Default settings. In addition, an Access Point may be manually configured via the Harmony system’s Web browser interface.

When an Access Point successfully partners with an AP Controller, the Access Point’s Status LED turns green. If an Access Point in Dependent mode cannot find an AP Controller to partner with, the Access Point’s Status LED remains amber.

Refer to the *Harmony Access Point Controller Model 7560 User’s Guide* for additional information about AP Controllers and the Harmony architecture.

Flexible Mode

When configured to Flexible, an Access Point will attempt to partner with an AP Controller during boot-up.

If an AP Controller is found, the Access Point will operate in Dependent mode and partner with the AP Controller. The Access Point will remain in Dependent mode until it is rebooted.

If an AP Controller is not found within one minute, the Access Point will operate in Independent mode and monitor to the network to see if an AP Controller joins the network. If an AP Controller is then added to the network, the Access Point will partner with the AP Controller and switch to Dependent mode. The Access Point will remain in Dependent mode until it is rebooted.

By default, AP Controller Dependence is set to Flexible.

Roaming Between Access Points

If there are multiple Harmony 802.11b Access Points on the network, then a mobile client may seamlessly roam from one Access Point to another.

Each Access Point creates its own wireless cell or coverage area. This is also known as a Basic Service Set (BSS). A mobile device can communicate with a particular Access Point if it is within the Access Point's coverage area.

If the cells of multiple Access Points overlap, then the mobile client may switch from one Access Point to another as it travels throughout the facility. During the hand-off from one Access Point to another, the mobile client maintains an uninterrupted connection to the network. This is known as "roaming."

Multiple Access Points connected to a common Ethernet network form an Extended Service Set (ESS). All members of an Extended Service Set are configured with an ID, known as the SSID or ESSID. Mobile clients must be configured with the same SSID as the Access Points on the network; a client can only roam between Access Points that share the same SSID.

Roaming in Independent Mode

Mobile clients can roam between multiple Harmony 802.11b Access Points operating in Independent mode.

As shown in Figure 4, three Harmony 802.11b Access Points operating in Independent mode are connected to a common Ethernet network. A laptop computer with a Harmony 802.11b PC Card installed can move around the facility and roam between the three Access Points while maintaining an uninterrupted connection to the network.

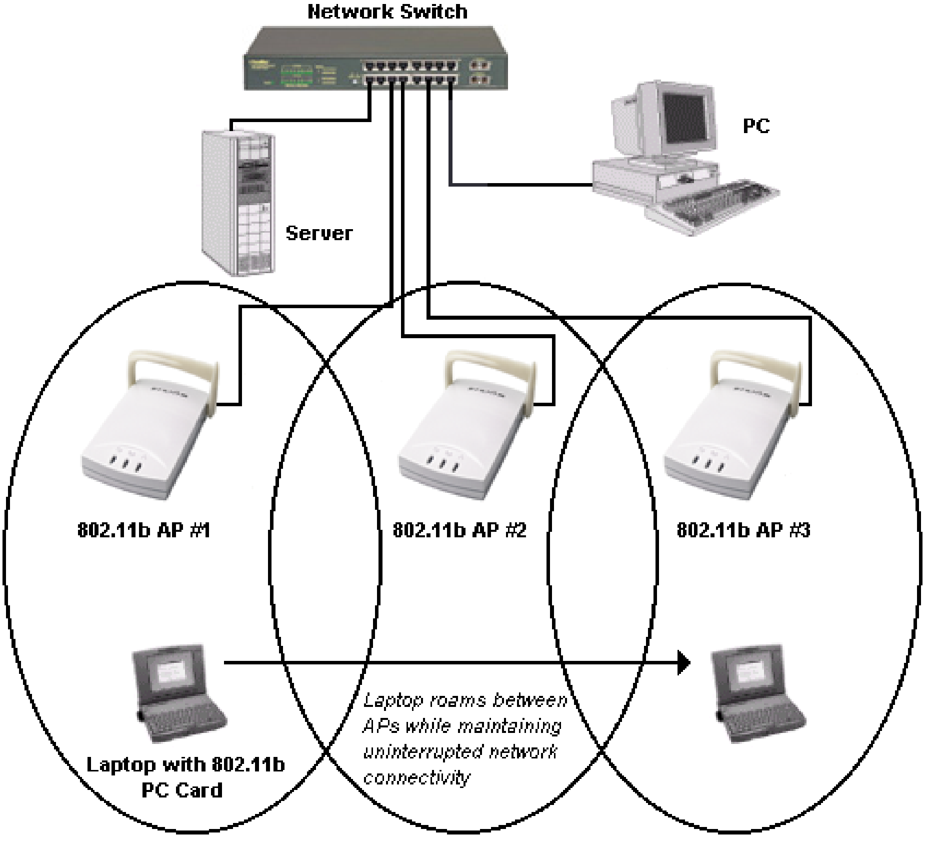

Network Switch
PC
Server
802.11b AP #1
802.11b AP #2
802.11b AP #3
Laptop with 802.11b PC Card
Laptop roams between APs while maintaining uninterrupted network connectivity

Figure 4
Roaming Between APs in Independent Mode

Note:
A Harmony 802.11b Access Point in Independent mode does not support roaming across routers.

Roaming in Dependent Mode

Harmony 802.11b Access Points that are partnered with an AP Controller also support roaming, as shown in Figure 5.

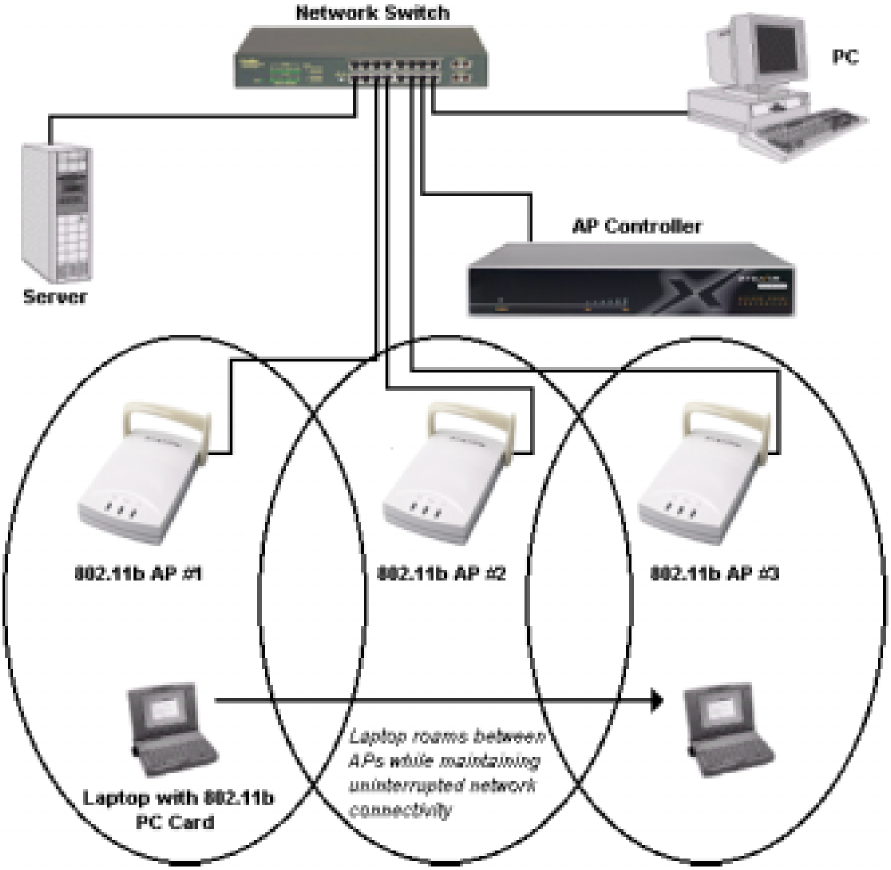

Network Switch
PC
Server
AP Controller
802.11b AP #1
802.11b AP #2
802.11b AP #3
Laptop with 802.11b PC Card
Laptop roams between APs while maintaining uninterrupted network connectivity

Figure 5
Roaming Between APs in Dependent Mode

In addition, a mobile client can roam between Access Points located on different IP networks as long as the Access Points on the remote networks are partnered to an AP Controller on the local network.

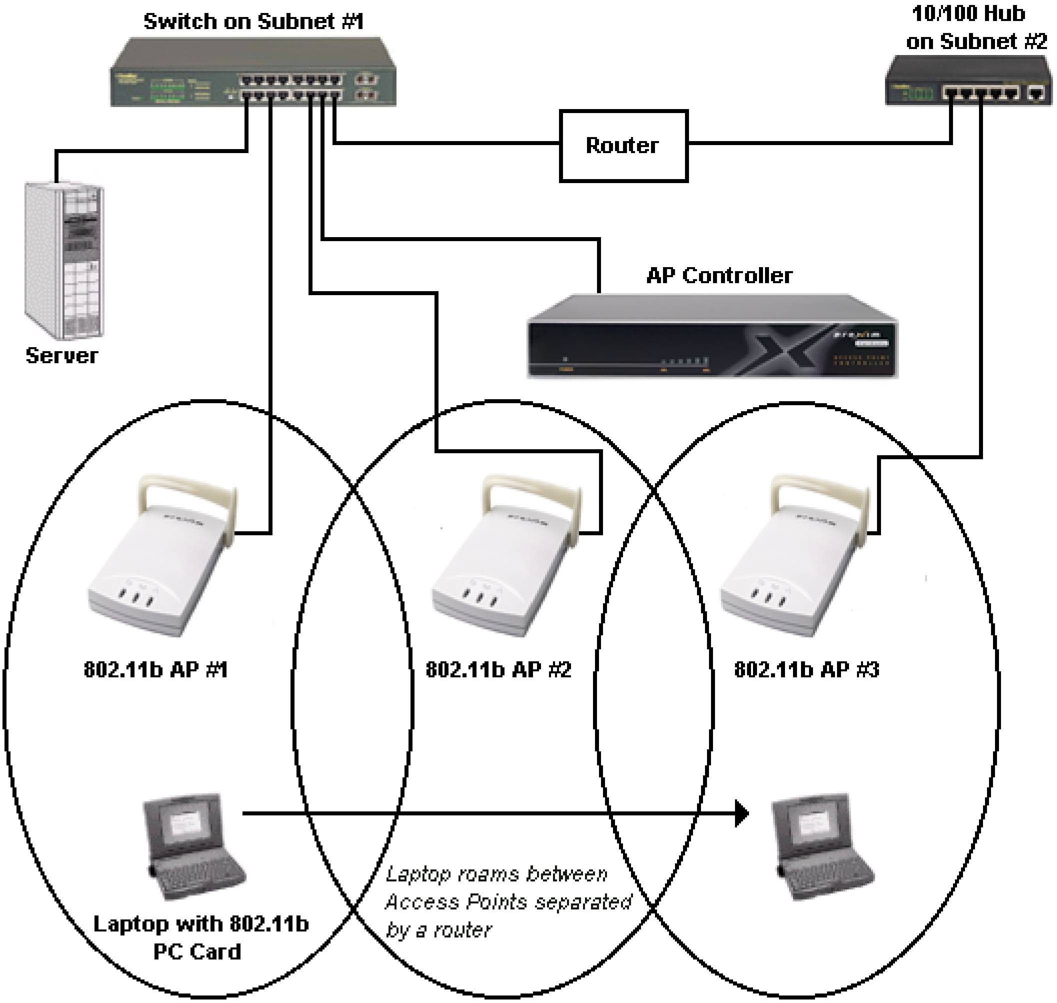


Figure 6
Roaming Across a Router

As shown in Figure 6, Access Point #3 is installed on the remote IP network but it is partnered with the AP Controller located on the local IP subnet. The mobile client can roam from Access Point #2 to Access Point #3 even though the Access Points are located on different IP subnets and are separated by a router. The client maintains an uninterrupted connection to the network and retains its assigned IP address that is valid on the local subnet.

This feature requires that the network administrator configure the AP Controller with a list of subnets used in the facility so the AP Controller and Access Points can communicate with each other across the router. Refer to the *Harmony Access Point Controller Model 7560 User's Guide* for more information.

Roaming Guidelines

- ☐ An 802.11b PC Card can only roam between 802.11b Access Points. An 802.11b PC Card cannot communicate with Harmony OpenAir Access Points.
- ☐ All Harmony 802.11b Access Points must have the same SSID.
- ☐ All workstations with Harmony 802.11b client adapters must have the same SSID as the Access Points that they will roam between.
- ☐ If WEP encryption is enabled, then all 802.11b Access Points and client adapters must use the same encryption level and WEP Key(s) to communicate.
- ☐ The Access Points' cells must overlap to ensure that there are no gaps in coverage and to ensure that the roaming client will always have a connection available.
- ☐ If the Access Points are operating in Independent mode, all of the 802.11b Access Points must be installed on the same IP subnet to support roaming.
- ☐ 802.11b Access Points support roaming across a router only when they are operating in Dependent mode and are partnered with an AP Controller.
- ☐ All Access Points in the same vicinity should use a unique, independent Channel. There are three independent Channels for 802.11b Access Points in the United States: 1, 6, and 11.

❑ Access Points that use the same Channel should be installed as far away from each other as possible to reduce potential interference.

❑ Proxim strongly recommends that you perform a site survey to determine the best location for each Access Point in the facility, as described in Proxim's free one-day technical training class. See Proxim's web site at **http://www.proxim.com/support/** for more information on the technical training class.

❑ An 802.11b Access Point and an OpenAir Access Point installed in the same vicinity may interfere with each other. If you use both 802.11b and OpenAir Access Points on your network, Proxim recommends that you test for potential interference first before deploying the equipment.

4. Access Point Management

This chapter describes how to access the Harmony Access Point Management tool, which is used to configure Harmony 802.11b Access Points operating in Independent mode. This management tool is accessed using a web browser such as Microsoft Internet Explorer 5 or Netscape Navigator 4.

If you are using the Harmony 802.11b Access Point in Dependent mode with an AP Controller, refer to the *Harmony Access Point Controller Model 7560 User's Guide* for information on how to configure and manage Access Points.

Accessing the Access Point Management Tool

Follow these steps to access the management tool via a Web browser:

1. Open a Web browser, such as Microsoft Internet Explorer 5 or Netscape Navigator 4, on a computer that is on the same IP network as the Access Point.

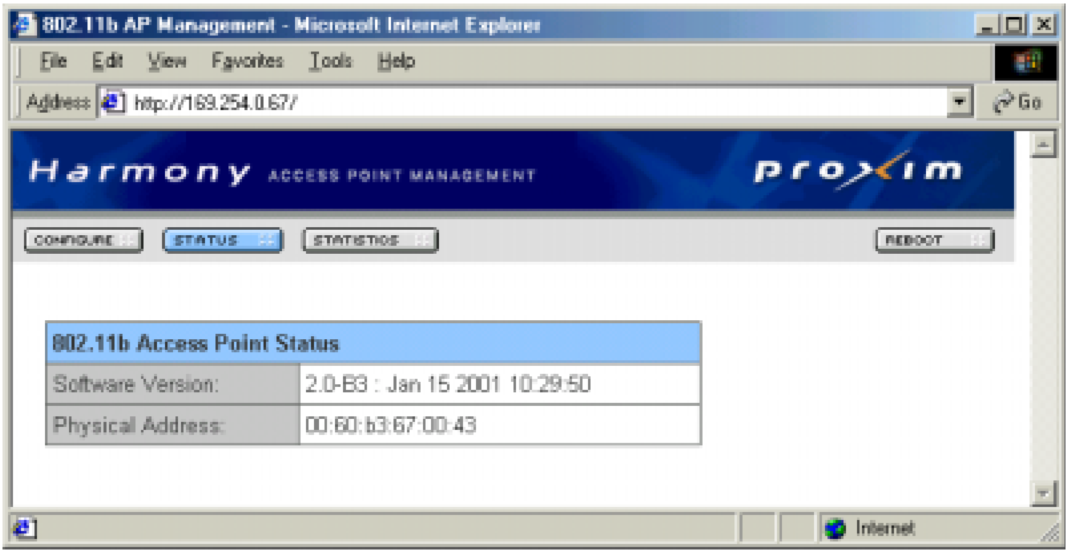
2. In the **Location** or **Address** field, enter the IP address of the Access Point.

   For example, if the Access Point's IP address is 169.254.0.67, type **http://169.254.0.67** and hit **<Enter>** to access the management tool, as shown in the example on the next page.

Note:
For information on the Access Point's IP address, refer to the "Access Point's IP Address" section later in this chapter.

3. Select one of the four buttons located at the top of the screen to manage the Access Point.

Note:
*You will be prompted to enter a User Name and Password if you select either the <**Configure**> or the <**Reboot**> button. The User Name is "admin". The default Password is "proxim". The User Name and Password are case-sensitive.*



802.11b Access Point Status	
Software Version:	2.0-B3 : Jan 15 2001 10:29:50
Physical Address:	00:60:b3:67:00:43

The <**Reboot**> button is described at the end of this chapter. The <**Configure**>, <**Status**>, and <**Statistics**> buttons are described in Chapters 5 through 7.

Note:
Close all instances of the computer's Web browser to exit from the Harmony Access Point Management tool.

Access Point's IP Address

You can configure the Access Point's IP address in one of three ways:

☐ The Access Point can receive a dynamic IP address from a network DHCP (Dynamic Host Configuration Protocol) server.

☐ The Access Point is assigned a default IP address of 169.254.*x.y* at the factory. This IP address is printed on the underside of the unit along with its serial number and physical (or MAC) address. The Access Point will use this IP address if a DHCP server is not present on the network.

☐ The Access Point can be assigned a static IP address via the Harmony Access Point Management tool.

IP Address Assigned by DHCP

If you have a DHCP (Dynamic Host Configuration Protocol) server on the network, then the DHCP server will automatically assign the Access Point an IP address when the Access Point is powered up.

To determine what IP address has been assigned to the Access Point, review the IP address assignment list generated by the DHCP server. The DHCP server should provide a list of physical addresses and the corresponding IP addresses that it has assigned to these devices. Locate the AP's physical address on the list to identify its assigned IP address.

Note:
The AP's physical address is listed on the underside of the unit along with its serial number and default IP address. The physical address is typically written as six pairs of two hexadecimal digits separated by colons (for example, 00:20:A6:34:00:12).

Once you have identified the AP's IP address, enter this address in a Web browser's Location or Address field on a network computer to access the Harmony Access Point Management tool.

Default IP Address

If your network does not contain a DHCP server, then the Access Point will use the default IP address assigned at the factory. The default IP address is listed on the underside of the unit along with the Access Point's serial number and physical address. The Access Point's default IP address is in the 169.254.0.0 network.

If the Access Point is using its default IP address, then you must configure a network computer with a unique IP address in the 169.254.0.0 network in order to access the Harmony Access Point Management tool.

For example, if the Access Point's default IP address is 169.254.5.23, then configure one of the network computers with an IP address of 169.254.0.1 and a subnet mask of 255.255.0.0 (assuming that 169.254.0.1 is not already assigned to another network device). Restart the network computer if prompted for the new IP address to take effect.

Once the network computer has restarted, open a web browser and type the IP address of the Access Point in the **Location** or **Address** field and hit <**Enter**> to access the management tool.

Static IP Address

The Access Point also accepts a static IP address. You may manually configure the IP address, subnet mask, and default gateway used by the Access Point within the Harmony Access Point Management tool. See Chapter 5 for details.

Note:
You must use either the Access Point's default IP address or a dynamically assigned IP address to access the management tool before you can configure the Access Point with a static IP address.

Rebooting an Access Point Via the Management Tool

Follow these steps to reboot an Access Point remotely via the Harmony Access Point Management tool:

1. Open the Harmony Access Management tool, as described earlier in this chapter.

2. Click the <**Reboot**> button.

The Access Point will be reset automatically and the management tool will report: "The Access Point is being rebooted..."

3. Wait approximately 15 seconds and then select one of the buttons at the top of the screen (i.e., <**Configure**>, <**Status**>, or <**Statistics**>) to reset the Harmony Access Point Management tool.

Note:
If the Access Point is configured for Flexible mode and you do not have an AP Controller on the network, mobile clients will be unable to communicate with the Access Point until it switches to Independent mode (which should occur approximately one minute following the reboot).

5. Configuration Parameters

This chapter describes the operating parameters that can be configured for the 802.11b Access Point within the Harmony Access Point Management tool.

Follow these steps to view the Access Point's configuration parameters:

1. Open the Harmony Access Point Management tool, as described in Chapter 4.

2. Click the <**Configure**> button.

3. When prompted, enter the management tool's User Name and Password. The User Name is "admin". The default Password is "proxim". The User Name and Password are case-sensitive.

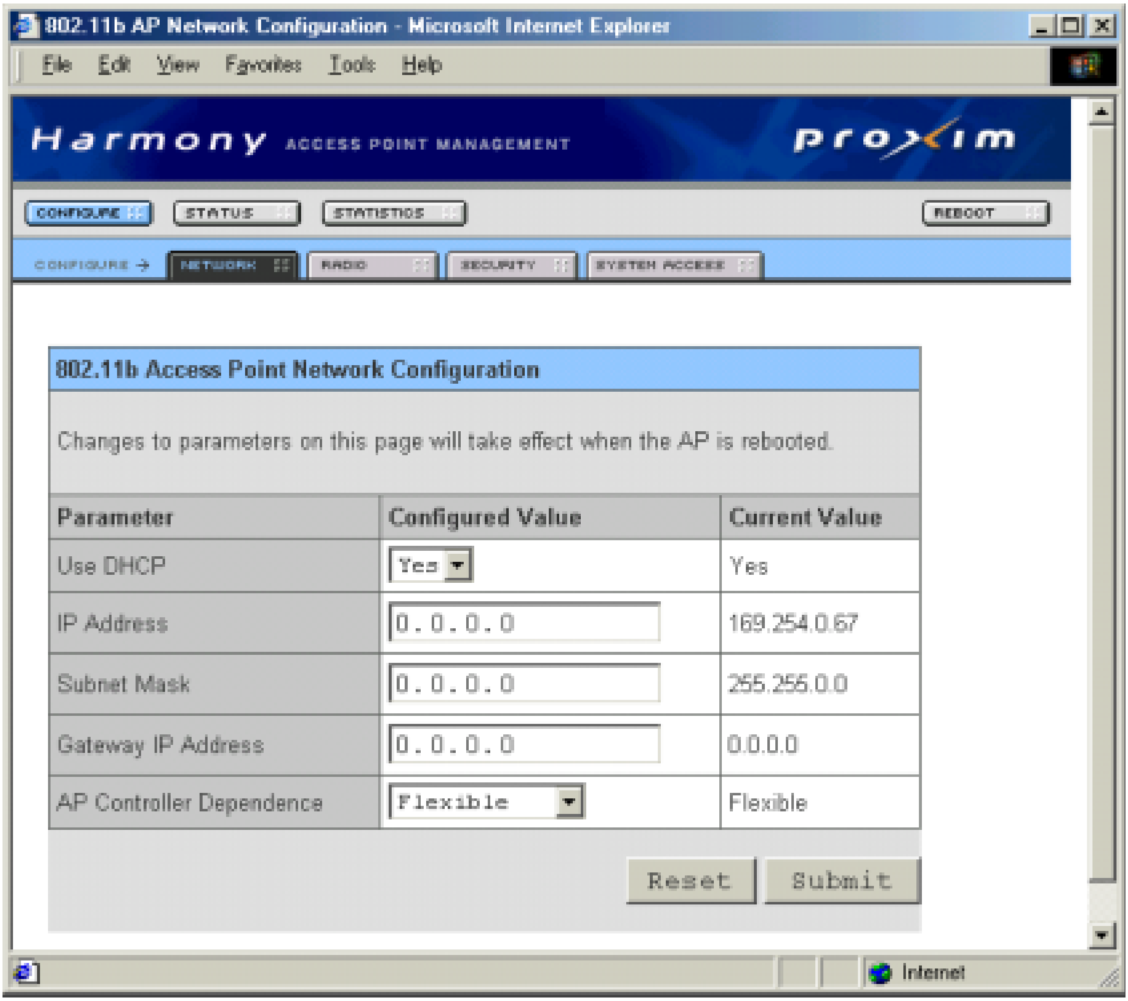
3. Select one of the four tabs (**Network**, **Radio**, **Security**, and **System Access**) to view the configuration settings for the Access Point.

4. Change the configuration settings as necessary.

Note:
*If you make a mistake while configuring the Access Point, click <**Reset**> to clear any changes you made and return each parameter to its current setting.*

5. When finished, click <**Submit**> to save the changes. The changes will take effect immediately, except for the Network parameters, which will not take effect until the Access Point is rebooted.

The 802.11b Access Point Network Configuration screen is shown in the following example.


802.11b AP Network Configuration - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Harmony ACCESS POINT MANAGEMENT
proxim
CONFIGURE
STATUS
STATISTICS
REBOOT
CONFIGURE →
NETWORK
RADIO
SECURITY
SYSTEM ACCESS
Reset
Submit
Internet

802.11b Access Point Network Configuration

Changes to parameters on this page will take effect when the AP is rebooted.

Parameter	Configured Value	Current Value
Use DHCP	Yes	Yes
IP Address	0.0.0.0	169.254.0.67
Subnet Mask	0.0.0.0	255.255.0.0
Gateway IP Address	0.0.0.0	0.0.0.0
AP Controller Dependence	Flexible	Flexible

The four configuration screens (Network, Radio, Security, and System Access) and the parameters listed within each are described below.

Network

The 802.11b Access Point Network Configuration screen lists the current and configured values for the Access Point's IP information and operating mode.

The parameters listed within the 802.11b Access Point Network Configuration screen are described below.

Note:
You must reboot the Access Point before any new network settings will take effect.

Use DHCP

This parameter determines if the 802.11b Access Point will send out a DHCP request during boot-up.

If you have a DHCP server on the network, set the Use DHCP option to "Yes" so that the Access Point can receive an automatic IP address assignment.

If you do not have a DHCP server on the network but want the Access Point to use its default 169.254.*x.y* address (this is also known as Auto-IP), set the Use DHCP option to "Yes."

If you want to assign the Access Point a static IP address, set the Use DHCP option to "No" and configure the IP Address, Subnet Mask, and Gateway IP Address.

Note:
The Access Point will retain a static IP address even if an AP Controller is installed on the network. The Access Point's IP Addressing options within the Harmony System's Web browser interface cannot override the Access Point's static IP address. To assign the Access Point an IP address via the Harmony System's Web browser interface, configure the Use DHCP parameter, described above to "Yes."

Use DHCP is set to "Yes" by default.

IP Address

Enter an IP address in the field provided to assign the Access Point a static IP address.

Note that the Use DHCP parameter must be set to “No” before the Access Point will use the configured static IP settings.

Subnet Mask

Enter a subnet mask in the field provided to assign the Access Point a static subnet mask.

Note that the Use DHCP parameter must be set to “No” before the Access Point will use the configured static IP settings.

Gateway IP Address

Enter the IP address of a network gateway in the field provided to assign the Access Point a static default gateway address.

Note that the Use DHCP parameter must be set to “No” before the Access Point will use the configured static IP settings.

AP Controller Dependence

The AP Controller Dependence parameter determines the Access Point’s operating mode. The options are Independent, Dependent, and Flexible.

Refer to Chapter 3 for a description of each of these options.

By default, AP Controller Dependence is set to Flexible, which means that the Access Point will look for an AP Controller at boot-up. If an AP Controller is not available, the Access Point will operate in Independent mode.

Radio

The 802.11b Access Point Radio Configuration screen lists the IEEE 802.11b radio parameters that can be configured by the user.

These settings only apply to the Access Point when it is operating in Independent mode. If the Access Point is operating in Dependent mode, the AP Controller will automatically configure the Access Point using the AP AutoConfigure Default settings the first time the Access Point is connected to the network. Refer to the *Harmony Access Point Controller Model 7560 User's Guide* for information.

Note:

This screen is not available if the Access Point is operating in Dependent mode. In that case, use the Harmony System's Web browser interface to configure the AP's parameters.

You can configure and view the following 802.11b Access Point Radio parameters.

Channel

IEEE 802.11b devices are direct sequence spread spectrum devices that spread a radio signal over a range of frequencies. The range of frequencies used by a direct sequence device is called a Channel.

The IEEE 802.11b specification supports up to 14 overlapping Channels for radio communication (11 Channels are supported in the United States). Of these 14 Channels, only three Channels, 1, 6, and 11, are non-overlapping and will not interfere with each other.

To minimize interference, configure each Harmony 802.11b Access Point to use a different, independent Channel (1, 6, or 11).

If you have more than three Access Points on your network or in your facility, you will need to use the same independent Channel on multiple units. In that case, make sure that the Access Points sharing the same Channel are as far away from each other as possible, based on the results of your site survey of the facility.

SSID

The SSID is a string of up to 32 ASCII characters that must match on all communicating 802.11b devices within the same network. SSID stands for Service Set ID. The SSID is also referred to as the “ESSID” or “Extended Service Set ID.”

All Harmony 802.11b Access Points and Harmony 802.11b client adapters must have the same SSID to allow a mobile client to roam between Access Points.

By default, the SSID is set to “proxim.”

Supported Clients

802.11b products can operate at 11 Mbps, 5.5 Mbps, 2 Mbps or 1 Mbps. This allows 802.11b devices to communicate with any existing 802.11 direct sequence devices that operate only at 1 or 2 Mbps.

By default, the Harmony 802.11b Access Point will support both 802.11b and 2 Mbps 802.11 direct sequence clients. If you want the Harmony 802.11b Access Point to only support 11 Mbps 802.11b clients, select the “11 Mbps clients only” option.

Supported Rates

The IEEE 802.11b specification supports four data rates: 11 Mbps, 5.5 Mbps, 2 Mbps, and 1 Mbps. As a mobile client travels further and further away from an 802.11b Access Point, the data rate automatically decreases in order to maintain a usable radio connection. Therefore, a client that is close to an Access Point may operate at 11 Mbps, but a client that is far away from the Access Point may operate at 2 Mbps.

By default, the Harmony 802.11b Access Point supports all four data rates. However, you can prevent the Access Point from using a specified data rate by unchecking the appropriate box.

For example, if your application requires that the Harmony 802.11b PC Card maintains an 11 Mbps data rate, you can uncheck the 5.5 Mbps, 2 Mbps, and 1 Mbps options. The Access Point and PC Card will always attempt to operate at 11 Mbps but this may greatly reduce the size of the coverage area provided by the Access Point. Once the PC Card moves outside the range that provides 11 Mbps operation, the PC Card will lose connectivity with the network.

RTS/CTS Threshold

The 802.11b standard supports optional RTS/CTS communication based on packet size.

Without RTS/CTS, a sending radio listens to see if another radio is already using the medium before transmitting a data packet. If the medium is free, the sending radio transmits its packets. However, there is no guarantee that another radio is not transmitting a packet at the same time, causing a collision.

When RTS/CTS occurs, the sending radio first transmits a Request to Send (RTS) packet to confirm that the medium is clear. When the receiving radio successfully receives the RTS packet, it transmits back a Clear to Send (CTS) packet to the sending radio. When the sending radio receives the CTS packet, it sends the data packet to the receiving radio. The RTS and CTS packets contain a reservation time to notify other radios that the medium is in use for a specified period of time. This helps to minimize collisions.

While RTS/CTS adds overhead to the radio network, it is particularly useful for large packets that take longer to resend after a collision occurs.

You may configure a Harmony 802.11b Access Point to always use RTS/CTS, never use RTS/CTS, or use RTS/CTS for packets over a certain size.

For example, if the RTS/CTS Threshold is set to 1000 Bytes, then a sending radio will use RTS/CTS before transmitting any packet 1000 Bytes or larger.

The RTS/CTS Threshold parameter supports a range between 1 and 1513 Bytes (which is the largest Ethernet packet the radio can transmit). When set to 1, a sending radio will use RTS/CTS before transmitting any packet. When set to 1513, a sending radio will not use RTS/CTS for any packets except those that are 1513 Bytes.

Security

The IEEE 802.11b standard specifies an optional encryption feature, known as Wired Equivalent Privacy or WEP, that is designed to provide a wireless LAN with a security level equal to what is found on a wired Ethernet network.

WEP encrypts the data portion of each packet exchanged on the 802.11b network using either a 40-bit or 128-bit encryption algorithm. In addition, WEP is also used in conjunction with the optional Shared Key Authentication algorithm to prevent unauthorized devices from associating with an 802.11b network.

You can configure and view the following 802.11b Access Point WEP Security parameters.

Note:
This screen is not available if the Access Point is operating in Dependent mode. In that case, use the Harmony System's Web browser interface to configure the AP's Security parameters.

WEP Encryption

The Harmony 802.11b Access Point offers four configuration options for WEP Encryption: Off, Encryption, Authentication, and Authentication and Encryption.

When set to **Off**, the Access Point does not encrypt any data or authentication packets.

When set to **Encryption**, the Access Point only uses WEP to encrypt data. Two 802.11b devices must have the same WEP Keys to exchange data. For authentication purposes the Access Point uses Open System Authentication, which allows any 802.11b device to associate with an 802.11b network.

When set to **Authentication**, the Access Point uses WEP only during authentication; this corresponds to Shared Key Authentication.

Shared Key Authentication requires that two 802.11b devices must have the same WEP Keys in order to communicate. In addition, both devices must be configured to support

Shared Key Authentication. If one device is configured to use Shared Key Authentication but a second device is not, then the two devices will not communicate, even if both devices have the same WEP Keys.

When set to **Authentication and Encryption**, the Access Point uses WEP to encrypt and decrypt both authentication messages and data packets.

Note:
When the Harmony 802.11b Access Point is configured to Use WEP for Authentication and Encryption, all of the other 802.11b devices on the same network must use WEP both during authentication (Shared Key Authentication) and to encrypt data.

All 802.11 Access Points and 802.11b client adapters within an ESS must have the same encryption level and use the same WEP Key to communicate.

WEP Key Size

The Harmony 802.11b Access Point supports both 40 and 128-bit encryption using the Wired Equivalent Privacy (WEP) algorithm. 128-bit encryption is available only in the United States.

Select the type of encryption you want to use (40 or 128 bit) and configure one to four WEP Keys.

Default Key

Each Access Point can store four 40-bit or four 128-bit WEP Keys.

You must select one of these four keys as the default key that the Access Point will use to encrypt and decrypt authentication packets and data.

Default Key 1, the default setting, corresponds to WEP Key 1 (either the 40-bit or 128-bit key, depending on the configured WEP Key Size).

WEP Keys

An 802.11b device with WEP enabled uses a WEP Key (also known as an Encryption Key) to encrypt and decrypt information. If the WEP Keys do not match on two radios and WEP Encryption is enabled, the two devices will be unable to associate and/or exchange data (depending on the WEP Encryption setting).

Use the same WEP Key(s) on all of the 802.11b devices on your network.

Note:
In order to communicate when WEP is enabled, all 802.11b devices on the same network must use the same default WEP Key.

For 40-bit encryption, the WEP Key is expressed as 5 sets of two hexadecimal digits (0-9 and A-F). The Harmony 802.11b Access Point can store up to four 40-bit WEP Keys.

For 128-bit encryption, the WEP Key is expressed as 13 sets of two hexadecimal digits (0-9 and A-F). The Harmony 802.11b Access Point can store up to four 128-bit WEP Keys.

System Access

Each time a user opens the Harmony Access Point Management tool and clicks either the <**Configure**> or <**Reboot**> button, the user is prompted to enter a User Name and Password.

The User Name is “admin”. It is case-sensitive and cannot be changed.

The default Password is “proxim”.

Follow these steps to change the Password:

1. Open the Harmony Access Point Management tool.
2. Click the <**Configure**> button.
3. Enter the User Name and current Password.
4. Click the **System Access** tab.
5. Enter a new Password in the **Enter New Web Password** field.

Note:
The Password is case-sensitive and cannot exceed 12 characters.

6. Enter the new Password a second time in the **Confirm New Web Password** field.
7. Click <**Submit**> for this change to take effect.
8. Reenter the Access Point’s IP address in the Web browser’s **Location** or **Address** field to reset the Harmony Access Point Management tool.

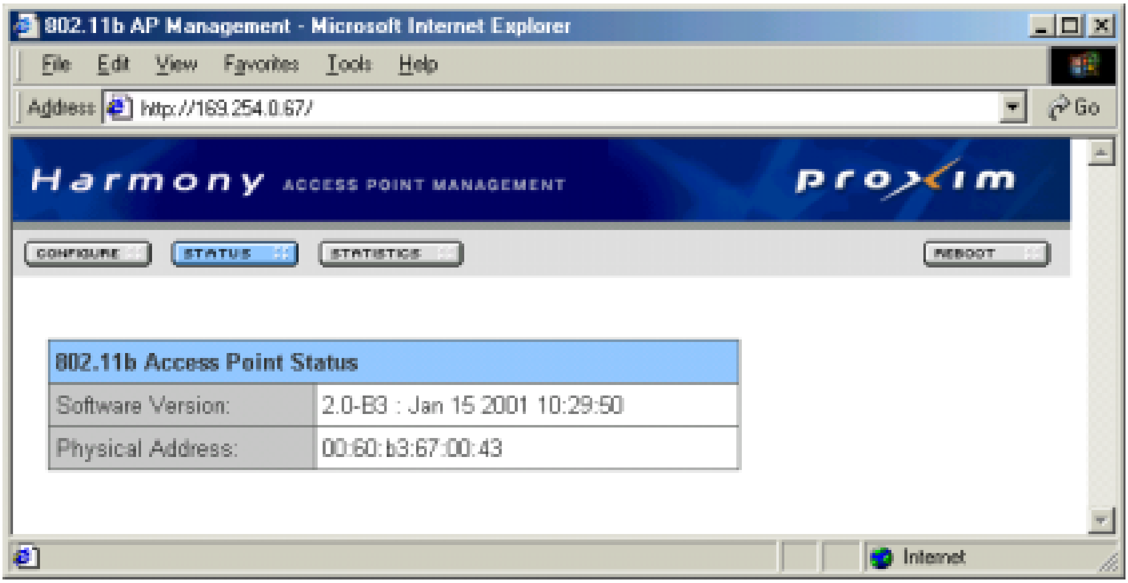
Note:
If you forget the Access Point’s Password, contact Proxim Technical Support for assistance.

6. Status

Click the <**Status**> button to view the 802.11b Access Point Status screen. The Status screen reports the following information:

- **Software version:** This field reports the Flash Code version installed on the Access Point. Periodically, Proxim makes new Flash Code available for Harmony Access Points on Proxim's Web site. You can update an Access Point's Flash Code using the Harmony System's Web browser interface or an Access Point upgrade tool (which will be posted on Proxim's Web site with new Flash Code versions). If you are experiencing a problem with your Harmony equipment, a Proxim Technical Support representative may ask you to report the device's Flash Code version.
- **Physical Address:** A Harmony 802.11b Access Point's physical address is assigned at the factory and cannot be changed by the end user. The physical address or MAC address is a 48-bit unique identifier assigned to each networking device. The physical address is commonly written as six pairs of two hexadecimal digits separated by colons (for example, 00:60:b3:6e:00:77).

The 802.11b Access Point Status screen is shown in the following example.



802.11b Access Point Status	
Software Version:	2.0-B3 : Jan 15 2001 10:29:50
Physical Address:	00:60:b3:67:00:43

7. Statistics

Click the <**Statistics**> button to view the 802.11b Access Point Statistics screen. An Access Point's Statistics are divided into two sections: Ethernet Statistics and Radio Statistics, described below.

Note:
The statistics are reset to zero each time the Access Point is rebooted.

Radio Statistics

The Radio Statistics provide information concerning the number of packets sent and received by an Access Point over the radio network.

The following Radio Statistics are available for an 802.11b Access Point:

Transmit Statistics

- **Number of Packets Transmitted:** This statistic is divided into the number of unicast packets transmitted and the number of multicast packets transmitted. Unicast packets are destined for a single network node; multicast packets are destined for more than one network node.

- **Number of Bytes Transmitted:** This statistic is divided into the number of bytes transmitted in unicast packets and the number of bytes transmitted in multicast packets.

- **Single Retries:** After the AP sends a packet, it waits for an acknowledgment from the receiving radio to confirm that the packet was successfully received. If an acknowledgment is not received within a fixed period of time, the AP will retransmit the packet. This statistic reports the number of packets that required one retry before the AP received an acknowledgment.

- **Multiple Retries:** This statistic reports the number of packets that required more than one retry before the AP received an acknowledgment.

- **Retries Exceeded:** This statistic reports the number of packets for which the AP did not receive an acknowledgment within the maximum number of retries.

- **Transmissions Discarded:** This statistic reports the number of packets discarded by the radio due to a transmission error, such as exceeding the number of retries.

Receive Statistics

- **Number of Packets Received:** This statistic is divided into the number of unicast packets received and the number of multicast packets received.

- **Number of Bytes Received:** This statistic is divided into the number of bytes received in unicast packets and the number of bytes received in multicast packets.

- **FCS Errors:** An FCS Error occurs when a received packet fails the CRC (Cyclic Redundancy Check) of the Frame Check Sequence (FCS).

- **No Buffers:** An Access Point’s radio temporarily stores the packets it receives over the wireless medium before forwarding them to the Ethernet network. The radio stores these packets in its buffer memory, which only has a limited amount of space available. A No Buffers error occurs when the radio’s buffer memory is full and the radio cannot receive additional packets from the wireless medium. This may result in lost data or delayed transmissions.

- **Decryption Errors:** Number of packets that were discarded due to a problem during decryption, such as mismatched WEP Keys.

Ethernet Statistics

The Ethernet Statistics provide information concerning the number of packets sent and received by an Access Point over the Ethernet network.

The following statistics appear under the Ethernet Statistics heading:

- ☐ **Number of Packets Sent**
- ☐ **Number of Packets Received**
- ☐ **Number of Collisions**
- ☐ **Frame Align Errors:** An Alignment Error occurs when a received packet does not end on a byte boundary. This also causes a CRC Error packet.
- ☐ **CRC Errors:** A CRC Error occurs when a received packet fails the CRC (Cyclic Redundancy Check).
- ☐ **Packets Filtered:** This statistic displays the number of packets that the Access Point did not forward to the radio network because the packet's destination was listed in the AP's forwarding table as a node on the Ethernet network.
- ☐ **Receive Overflow:** An Access Point temporarily stores the packets it receives from the Ethernet network before forwarding them to the radio network. The Access Point stores these packets in its buffer memory, which only has a limited amount of space available. The receive buffer overflows when the buffer memory is full and the Access Point receives additional packets from the Ethernet network. This may result in lost data or delayed transmissions. This statistics reports the number of times that the receive buffer has overflowed.

8. Performance Hints

This section provides the user with ideas for how to improve the performance of a Harmony 802.11b network.

Microwave Ovens

Microwave ovens operate in the same frequency band as the Harmony 802.11b Access Point. Therefore, if you use a microwave within range of the Access Point you may notice network performance degradation. However, both your microwave and your Access Point will continue to function.

Range

Every environment is unique with different obstacles, barriers, materials, etc. and, therefore, it is difficult to determine the exact range that will be achieved without testing. However, Proxim has developed some guidelines to estimate the range that users will see when the product is installed in their facility, but there are no hard and fast specifications.

Radio signals may reflect off of some obstacles or be absorbed by others depending on their construction. For example, with two 802.11b radios, you may achieve up to 1000' in open space outdoors where the two antennas have line of sight, meaning they see each other with no obstacles. However, the same two units may only achieve up to 300' of range when used indoors.

The IEEE 802.11b specification supports four data rates: 11 Mbps, 5.5 Mbps, 2 Mbps, and 1 Mbps. Operation at 1 Mbps provides greater range than operation at 11 Mbps. The Harmony 802.11b Access Point will automatically adjust the data rate to maintain a usable radio connection.

Therefore, a client that is close to the Access Point may operate at 11 Mbps while a client that is on the fringe of coverage may operate at 1 Mbps. As described in Chapter 4, you can configure the data rates that the Access Point will use. Note that if you limit the range of data rates available to the Access Point, you may reduce the effective range of the Harmony 802.11b products.

External antenna options are available for the Model 8551 Access Point that can increase the product's range. Contact your Proxim reseller for more information.

Proper antenna placement can help improve range. Here are some guidelines:

- The Model 8550 Access Point's integral diversity antenna should be placed so that it emits its signal in the appropriate direction. For best results, place the antenna in the up or vertical position, as shown in Figure 1 on page 13.

- An external omnidirectional antenna for the Model 8551 Access Point should be placed in a vertical position. It can be mounted upside down to the ceiling or a beam.

- Place the antenna as high as possible. In an office environment, try to place it above cubicle walls.

- Do not place a sheet of metal (like a filing cabinet) between two antennas.

- Two antennas that are communicating should be in the same plane. For example, do not lie one antenna on its side and have its partner standing upright.

9. Troubleshooting

The Harmony 802.11b Access Point is designed to be very easy to install and operate. However, if you experience difficulties, use the information in this chapter to help diagnose and solve problems.

Also, refer to the *Harmony Access Point Controller Model 7560 User's Guide* if you are using the Access Point in Dependent mode for additional troubleshooting suggestions.

If you cannot resolve a problem, contact Proxim Technical Support, as described in Appendix D, "How to Reach Technical Support."

How to Obtain Help with Your LAN Installation

If you require assistance to install your LAN, Proxim can put you in contact with a Harmony reseller in your area. The reseller is an expert in the design, installation, and maintenance of LANs and will be able to examine your needs and recommend the most cost-effective solution for your LAN, whether you are installing a new LAN or adding on to an existing one. For the location of the Harmony reseller nearest you, contact Proxim at 1-800-229-1630 and ask for the Sales Department.

LED Error Codes

The Status LED, located on the top of the Harmony 802.11b Access Point, will flash red in a repeating pattern to indicate the following errors:

1 blink: Memory error
2 blinks: Flash write error
3 blinks: Ethernet initialization error
4 blinks: Radio initialization error

If you see any of the above flashing sequences, recycle power to the Access Point. If the flashing sequence persists after you have reset the unit, make a note of which of the above patterns you have and contact Proxim Technical Support.

Common Problems and Solutions

Problem 1:

The Harmony 802.11b Access Point does not automatically register with a Harmony AP Controller.

Solution 1:

Follow these steps:

1. Confirm that the Link LED is on; this means that the Access Point has a network connection. If the LED is not on, try another Ethernet cable.

2. Try recycling power to the unit. The Access Point will try to contact an AP Controller during boot-up. Therefore, if you are using the external AC power supply, you should connect the AP to the Ethernet network before turning on the unit.

3. Access the Harmony Access Point Management tool and confirm that AP Controller Dependence is set to either Dependent or Flexible.

4. Access the Harmony system's Web browser interface and confirm that the "Allow New APs to Be Added Automatically" parameter is set to True.

4. If none of the above solves the problem, try to manually add the Access Point as described in the *Harmony Access Point Controller Model 7560 User's Guide*.

Problem 2:

My 802.11 PC Card will not associate with the Harmony 802.11b Access Point.

Solution 2:

Follow these steps:

1. Try to bring the devices closer together; the PC Card may be out of range of the Access Point.

2. Confirm that the Access Point and PC Card have the same SSID.

3. Confirm that the Access Point and PC Card have the same Encryption settings, if enabled.

4. Confirm that the Access Point's Status LED is green or blinking green. A PC Card cannot associate with an Access Point while the AP's Status LED is either amber or red.

Problem 3:
The Status LED is amber.

Solution 3:
The Status LED will turn solid amber under two conditions:

- ☐ The unit is initializing
- ☐ The unit has successfully initialized but could not find an AP Controller to partner with

If you do not have an AP Controller on the network, confirm that the AP Controller Dependence parameter is set to either Independent or Flexible. See Chapters 3 and 5 for details.

Problem 4:
The Status LED is blinking amber.

Solution 4:
The Status LED will blink amber if the Access Point requires a new firmware image. You can download a new firmware image to an Access Point using either the Harmony System's Web browser interface or the Access Point upgrade tool (posted on Proxim's Web site with new Flash Code versions) . If you have an AP Controller on the network, refer to the *Harmony Access Point Controller Model 7560 User's Guide* for information on upgrading Access Point firmware.

Problem 5:

The throughput seems slow.

Solution 5:

1. To achieve maximum throughput, verify that your antennas are well-placed, not behind metal, and do not have too many obstacles between them. If you move the client closer to the Access Point and throughput increases, you may want to consider adding a second Access Point and implementing roaming.

2. If you have an AP Controller on the network, check the Harmony System's filter settings to confirm that it is not forwarding unnecessary Ethernet traffic to mobile clients.

Problem 6:

How do I upgrade the firmware on an Access Point?

Solution 6:

Periodically, Proxim makes new Flash Code available for Harmony Access Points on Proxim's Web site at **http://www.proxim.com/support/**. You can update an Access Point's Flash Code using the Harmony System's Web browser interface or an Access Point upgrade tool (which will be posted on Proxim's Web site with new Flash Code versions). If you have AP Controller on the network, refer to the *Harmony Access Point Controller Model 7560 User's Guide* for details.

A. Parameters

Network

Parameter Name	Range	Default
Use DHCP	Yes, No	Yes
Static IP Address	-	0.0.0.0
Static Subnet Mask	-	0.0.0.0
Static Gateway IP Address	-	0.0.0.0
AP Controller Dependence	Independent, Dependent, Flexible	Flexible

Radio

Parameter Name	Range	Default
Channel	1-11; (1, 6, and 11 are independent)	11
SSID	1-32 characters	proxim
Supported Clients	11 Mbps clients only, Allow 2 Mbps clients	Allow 2 Mbps clients
Supported Rates	Any combination of 11 Mbps, 5.5 Mbps, 2 Mbps, 1 Mbps	All rates supported
RTS/CTS Threshold	Always on, Always off, Based on packet size	Always off

Security

Parameter Name	Range	Default
WEP Encryption	Off, Encryption, Authentication, Authentication and Encryption	Off
WEP Key Size	40 bit, 128 bit	40 bit
Default Key	1, 2, 3, 4	1
WEP Key(s)	10 hexadecimal digits for 40 bit encryption, 20 hexadecimal digits for 128 bit encryption	0000000000

System Access

Parameter Name	Range	Default
Web Password	0-12 characters	proxim

B. IEEE 802.11b Direct Sequence Channels

The IEEE 802.11b standard specifies 14 Channels within the 2.4 GHz frequency band. The following table lists the center frequency for each Channel.

If operating multiple Access Points in the same vicinity, the distance between the center frequencies must be at least 25 MHz to avoid interference. There are three independent Channels that do not overlap: 1, 6, and 11.

Note that the available Channels differ from country to country and based on Model number. In the United States, Channels 1 through 11 are available.

Channel Number	Center Frequency
1	2.412 GHz
2	2.417 GHz
3	2.422 GHz
4	2.427 GHz
5	2.432 GHz
6	2.437 GHz
7	2.442 GHz
8	2.447 GHz
9	2.452 GHz
10	2.457 GHz
11	2.462 GHz
12	2.467 GHz
13	2.472 GHz
14	2.484 GHz

C. Harmony 802.11b Access Point Specifications

The following technical specification is for reference purposes only. Actual product's performance and compliance with local telecommunications regulations may vary from country to country. Proxim, Inc. will only ship products that are type approved in the destination country.

Network Interfaces	Ethernet 10Base-T (Twisted-Pair)
Data Rate	11, 5.5, 2, and 1 Mbps — IEEE 802.11b 10 Mbps — Ethernet
Media Access Protocol	IEEE 802.11b
Ethernet compatibility	IEEE 802.3
Frequency Band	2.4-2.5 GHz Worldwide (Depends on country) (spread spectrum direct sequence)
Channels	1 to 14 (Depends on country and model number) 7 or 11 for the United States; 2 or 3 independent Channels
Output Power	16 dBm or 40 mW
Operating Temperature	0ºC to +50ºC
UL Listed Power Supply	The 802.11b Access Point requires power from either a Harmony Power System or from an external power supply. The Harmony 802.11b Access Point includes a UL listed, Class 2 power supply.

D. How to Reach Technical Support

If you’re having a problem using the Harmony 802.11b Access Point, gather the following information and contact Proxim Technical Support:

- ☐ What Harmony products are installed on the network?
- ☐ What were you doing when the error occurred?
- ☐ What error indication did you see?
- ☐ Can you reproduce the problem?

You can reach Proxim Technical Support by voice, fax, e-mail, or mail:

Tel: 800-477-6946 or 408-731-2640

Fax: 408-731-3676

Web: **http://www.proxim.com/**

E-mail: support@proxim.com

Mail: Proxim, Inc.
Attn: Technical Support
510 DeGuigne Drive
Sunnyvale, CA 94085

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